UNDERSTANDING ANTHROPOGENIC AIR POLLUTANT EMISSIONS IN ASIA

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INTRODUCTION

A regional inventory for Asia for the year 2000 was developed by (1) and widely examined during and following the TRACE-P experiment. However, because of the dramatic economic growth in East Asia since 2000, that inventory no longer represents the level of present-day emissions in East Asia, especially for China. China's gross domestic product (GDP) increased ~10% annually and coal consumption increased ~15% annually during the past 5 years. Atmospheric emissions are also thought to have increased markedly from space-based observations (2). In addition, some shortcomings in previous inventories were found, as a result of reanalysis of the inventories themselves and validation tests against forward and inverse modeling results and satellite retrievals. A true representation of trans-Pacific transport and the import of pollution into North America requires a revision of these emission estimates. A technology based, bottom-up methodology is developed to build a new anthropogenic emission inventory for Asia for the year 2006 in support of NASA's INTEX-B experiment.

METHODOLOGY

We are adopting a new strategy for this work, as follows: (a) use the TRACE-P inventory both as the foundation of the new dataset and as a default for work still in progress; (b) update China's emissions to the most recent year for which activity data are available, using an improved methodology documented in (3) and (4); (c) incorporate the best available datasets for selected regions where national inventories exist and are thought to be more reliable than the TRACE-P inventory; (d) for other regions in Asia, extrapolate the TRACE-P estimates to the most recent year based on updated activity statistics; (e) extrapolate the emission estimates to the year 2006 based on growth factors; and (f) check for consistency among the different datasets, choose an appropriate level of precision for the final product, fill gaps with the TRACE-P inventory, and finally export the dataset for the whole of Asia in a uniform data format. So far, under item (c), we have built in the following datasets: the India inventory from Dr. Reddy, the Japan inventory from Dr. Kannari, the Republic of Korea inventory from Dr. Park, a Taiwan inventory from the Taiwan EPB, and a Far East Russia inventory from IIASA.

RESULTS

We estimate total Asian anthropogenic emissions in the year 2006 as follows: 47.1 Tg SO_2, 36.7 Tg NO_x, 298.2 Tg CO, 54.6 Tg NMVOC, 29.2 Tg PM_{10}, 22.2 Tg $PM_{2.5}$, 2.97 Tg BC, and 6.57 Tg OC. Figure 1 presents the spatial distribution of NOx emissions, as an example. Compared with TRACE-P inventory for the year 2000, the SO2, NOx, CO, NMVOC and BC emissions in Asia were increased by 43.4%, 61.8%, 41.1%, 35.7%, and 46.9% separately, while OC emissions were decreased by 6.6%. The emission changes between the two inventories reflect a combination of: (a) actual growth in emissions due to increasing economic development, (b) the effects of replacing the TRACE-P inventory by local inventories in several countries, and (c) improvements and corrections made to the original TRACE-P inventory. The changes should not be viewed solely as real emissions growth. The 2006 inventory values are considered to be a reasonable reflection of the absolute magnitude of emissions in that year.

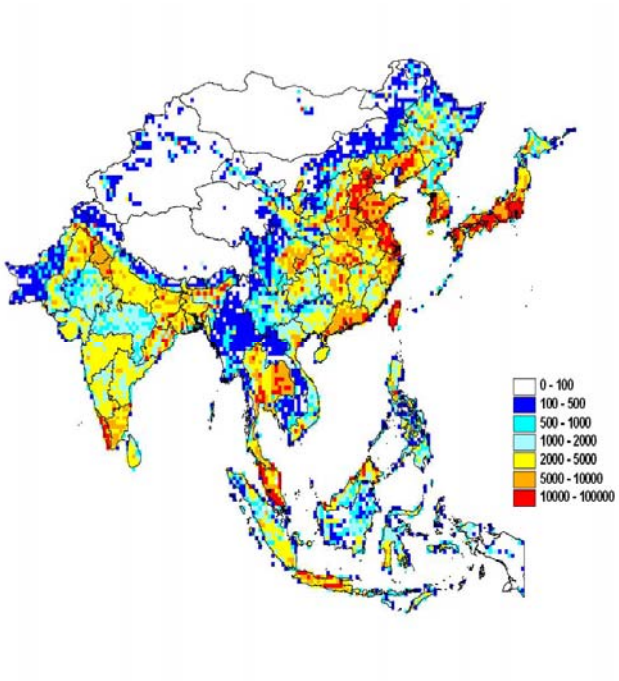

Fig. 1. Gridded emissions of NOx at 0.5 degree resolution. Unit: tons/yr per grid cell.

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